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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): T. HIROSE, et al
Serial No.: 09/800,495
Filed: March 8, 2001
For: METHOD OF DETECTING AND MEASURING ENDPOINT OF
POLISHING PROCESSING AND ITS APPARATUS AND
METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE
USING THE SAME
Group: 1765
Examiner: L. Umez Eronini

REQUEST FOR RECONSIDERATION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

July 1, 2004

Sir:

The following remarks are respectfully submitted in connection with the above-identified application in response to the Office Action March 3, 2004.

As to the rejection of claims 1, 2 and 19 under 35 U.S.C. 102(e) as being anticipated by Takeishi et al (US 6,425,801 B1); the rejection of claims 18 and 20 under 35 U.S.C. 103(a) as being unpatentable over Takeishi et al (US 6,425,801 B1); the rejection of claims 9, 24, 26, 27 and 28 under 35 U.S.C. 103(a) as being unpatentable over Takeishi et al (US 6,425,801 B1); and the rejection of claims 10 and 11 under 35 U.S.C. 103(a) as being unpatentable over Takeishi (US '801 B1) and further in view of Hiyama et al (US 5,838,447); such rejections are traversed, and reconsideration and withdrawal of the rejections are respectfully requested.

As to the requirements to support a rejection under 35 U.S.C. 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires that

each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

With regard to the requirements to support a rejection under 35 U.S.C. 103, reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Furthermore, such requirements have been clarified in the recent decision of In re Lee, 61 USPQ 2d 1430 (Fed. Cir. 2002) wherein the court in reversing an obviousness rejection indicated that deficiencies of the cited references cannot be remedied with conclusions about what is "basic knowledge" or "common knowledge". The court pointed out:

The Examiner's conclusory statements that "the demonstration mode is just a programmable feature which can be used in many different device[s] for providing automatic introduction by adding the proper programming software" and that "another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial" do not adequately address the issue of motivation to combine. This factual question of motivation is immaterial to patentability, and could not be resolved on subjected belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher."... Thus, the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion. (emphasis added)

In setting forth the rejection of claims 1, 2 and 19 as being anticipated by Takeishi et al, the Examiner describes the disclosure of Takeishi et al utilizing the language of the claims which is a mischaracterization of Takeishi et al. More particularly, the Examiner states in relation to Takeishi et al that:

The method comprises the steps of:

simultaneously irradiating lights having different wavelengths from one another onto an optically transparent film formed on a surface of a wafer on which patterns are formed under polishing processing (column 3, lines 35-35; column 4, lines 20-30 and 45-49; column 7, lines 4-14 and column 22, lines 48 - column 23, line 7);

separately detecting interference lights of said respective lights having the different wavelengths caused by interference between lights reflected from a surface of said thin film and surfaces of said patterns formed on said wafer with the lights of the different wavelengths which are irradiated (column 4, lines 32-38 and 49-58);

detecting the endpoint of polishing of said film on the basis of a relationship between intensities of the separately detected interference lights of the different wavelengths (column 4, lines 49-60). (emphasis added)

Applicants submit that irrespective of the contentions by the Examiner, Takeishi et al do not use the word "interference" throughout the disclosure thereof

and that Takeishi et al do not disclose in the sense of 35 U.S.C. 102 or teach in the sense of 35 U.S.C. 103 "interference lights of said respective lights having the different wavelengths caused by interference between lights reflected from a surface of said thin film and surfaces of said patterns formed on said wafer with the lights of the different wavelengths which are irradiated" (emphasis added) nor separately detecting the interference lights, as recited in independent claim 1. Likewise, Takeishi et al do not disclose in the sense of 35 U.S.C. 102 or teach in the sense of 35 U.S.C. 103 to the additional recited feature of claim 1 of "detecting the endpoint of polishing processing of said film on the basis of a relationship between intensities of the separately detected interference lights of the different wavelengths". (emphasis added)

Although the Examiner refers to col. 4, lines 32-38 and 49-58 of Takeishi et al in terms of the feature of separately detecting interference lights, applicants submit that there is no disclosure or teaching in Takeishi et al of providing interference lights caused by interference between lights reflected from a surface of the thin film and surfaces of patterns formed on the wafer with the lights of the different wavelengths which are irradiated. Applicants submit that assuming arguendo that interference lights do occur in Takeishi et al, there is no detection thereof nor separate detection thereof as recited in claim 1 and the dependent claims thereof, noting that such features are similarly set forth in the other independent claim of this application, in particular, independent claim 9.

As pointed out in previous amendments, the present invention utilizes interference lights P_1 and P_2 of different wavelengths in order to detect the end point of polishing processing as illustrated in Fig. 1, for example. That is, as described, lights L_1 and L_2 of different wavelength are simultaneously irradiated onto an optically transparent thin film 18 formed on a surface of the wafer 3 undergoing polishing processing and interference lights P_1 and P_2 are separately detected, as shown in Fig. 1, for example, which interference lights are generated by interference between

the lights reflected from a surface of the thin film and surfaces of the patterns formed on the wafer with the lights of the different wavelengths which are irradiated.

According to the present invention, the end point of polishing processing is detected on the basis of a relationship between intensities of the separately detected interference lights of the different wavelengths. That is, as described at page 18, lines 18-24 of the specification, the intensity ratio P_1/P_2 is determined and an end point T of the polishing processing is determined when the intensity ratio P_1/P_2 is equal to a value X_1 of a film thickness obtained by a calculation of an experiment. As is apparent, P_1 represents a detected interference light of one wavelength and P_2 represents a detected interference light of a different wavelength.

Applicants submit that it is apparent that the independent claims 1 and 9 and the dependent claims recite the features of detection of interference lights and utilization of the detected interference lights for determining the endpoint of the polishing processing as disclosed in this application, and such features are not disclosed by Takeishi et al in the sense of 35 U.S.C. 102 or rendered obvious in the sense of 35 U.S.C. 103, such that independent claims 1 and 9 and the dependent claims patentably distinguish over Takeishi et al and should be considered allowable thereover.

With regard to the rejections of the claims under 35 U.S.C. 103 as based solely on Takeishi et al, the Examiner recognizes that recited features are not disclosed by Takeishi et al. With regard to such features, the Examiner, for example, indicates with respect to the features in claims 18 and 20 of a white light and a UV light that "it would have been obvious to one having ordinary skill in the art at the time of claimed invention to modify Takeishi by employing white as well as UV light having different wavelengths for the purpose of obtaining the claimed invention". Applicants submit that this position by the Examiner represents a hindsight reconstruction attempt utilizing the principle of "obvious to try" which is not the standard of 35 U.S.C. 103 (see In re Fine, supra) as well as utilizing what applicant

has taught against its teacher which is not permissible (see In re Lee, supra). Thus, in addition to the features pointed out above with respect to the independent claims, applicants submit that dependent claims 18 and 20 further patentably distinguish over the cited art and should be considered allowable thereover.

With respect to independent claim 9 and the dependent claims thereof, as pointed out above, such claims recite the feature of detection of interference lights which is not disclosed or taught by Takeishi et al, irrespective of the position set forth by the Examiner. Additionally, the Examiner recognizes that claim 9 and the dependent claims thereof recite additional features not disclosed by Takeishi et al as pointed out at page 5 of the Office Action. However, the Examiner contends that it would be obvious to provide such nondisclosed features. Hereagain, applicants submit that the Examiner utilizes the principle of "obvious to try" which is not proper, and such claims patentably distinguish over Takeishi et al in the sense of 35 U.S.C. 103.

With respect to the detection of the endpoint of processing in the manner recited in independent claims 1 and 9, applicants note that Takeishi et al at col. 23, lines 46-61, describes that a surface of metal film 69 is processed to make it extremely thin so as to partially transmit light therethrough. A part of the light is reflected specularly by the thin metal layer 69 and another part which is passed through the metal layer 69 is reflected specularly by the underlying structure 61 and specularly reflected on the lower layer structural portion 61 so that as the metal film becomes thin, a component of the reflected light from the surface is decreased. It is readily apparent that Takeishi et al, irrespective of the position set forth by the Examiner, do not provide a disclosure or teaching of detecting the endpoint of processing on the basis of a relationship between intensities of the separately detected interference lights of the different wavelengths, as recited in independent claims 1 and 9 and the dependent claims thereof. As such, applicants submit that the independent and dependent claims of this application patentably distinguish over

Takeishi et al in the sense of 35 U.S.C. 102 and 35 U.S.C. 103, and should be considered allowable thereover.

With respect to claims 10 and 11, the Examiner recognizing the deficiencies of Takeishi et al contends that it would be obvious to combine the same with Hiyama et al by using Hiyama et al's polishing detection method of the purpose of reducing polishing time and labor. Hereagain, the Examiner has engaged in a hindsight reconstruction attempt utilizing the principle of "obvious to try". Applicants note that claims 10 and 11 recite the feature that a polishing rate of the film is evaluated on the basis of the intensities of the detected interference lights of the different wavelengths so as to change dressing conditions of a dresser to a pad used for polishing processing on the basis of the evaluation result, and that the dressing conditions include at least one of a dressing pressure, the number of revolutions, and a rocking motion period of said dresser and a type of working tool used for dressing, respectively. Applicants submit that Hiyama et al fails to overcome the deficiencies of Takeishi et al with respect to independent claim 9 and dependent claims 10 and 11.

Applicants note that Hiyama et al discloses a thickness or flatness detector in which as described at col. 6, lines 48-58, light emitted from the light emitting element of the sensor S, as illustrated in various figures, impinges on the oxide layer of the semiconductor wafer and is reflected from a top surface and a bottom surface of the oxide layer. The reflected lights from the top and bottom surfaces interfere with each other to thereby generate a certain color. The thickness of the oxide layer can be detected by analyzing the above color with the light-detecting element, noting that as described with respect to the other detectors, a light-detecting element is utilized for detecting the reflected light with an amplifier 9, analog filter 10, A/D converter 11, computing unit 12 and controller 13 being also utilized. Irrespective of this disclosure of Hiyama et al, applicants submit that Hiyama et al fail to disclose or teach detecting reference lights of the respective lights having the different wavelengths generated

by interference between lights reflected from a surface of the thin film and surfaces of the patterns formed on the wafer with the lights of the different wavelengths which are irradiated, as recited in claim 9 and the dependent claims. That is, even though Hiyama et al describes "interference", Hiyama et al does not provide for interference between lights reflected with lights of different wavelengths which are irradiated, nor detecting an endpoint of polishing processing in the manner defined. Thus, assuming arguendo that Hiyama et al could be combined with Takeishi et al, such combination would not provide the claimed features of claim 9 in the sense of 35 U.S.C. 103 nor the recited features of dependent claims 10 and 11, irrespective of the position set forth by the Examiner. As such, applicants submit that all claims present in this application patentably distinguish over the cited art and should be considered allowable thereover.

In view of the above remarks, applicants submit that the Examiner has mischaracterized the disclosure of the cited art and that the cited art does not provide the claimed features as set forth in independent claims 1 and 9 and the dependent claims thereof. Accordingly, all claims present in this application patentably distinguish over the cited art and should be considered allowable thereover. Therefore, an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (500.39825X00) and please credit any excess fees to such deposit account.

Respectfully submitted,



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